UNIVERSITY OF ALASKA ENGINEERING PROGRAMS: A COMMUNITY VIEW

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INTRODUCTION

The University of Alaska is developing a strategic plan for using its engineering resources to meet the needs of the engineering community. The goal of the university is to graduate enough engineers to meet the current and anticipated employment needs in engineering, as well as to provide appropriate professional development courses.

Mark Hamilton, the president of the University of Alaska; his Statewide Academic Council (SAC); and the engineering deans at the Anchorage (UAA) and Fairbanks (UAF) campuses contracted with the Institute of Social and Economic Research (ISER) to conduct a survey of leaders in Alaska's engineering community, to determine their needs. Working from a list provided by the UAF and UAA engineering deans, we conducted 35 interviews with representatives of 30 private companies and government agencies. This report summarizes what we learned in those interviews.

We start with a description of our methodology (including a summary of the limited information we were able to collect on the numbers and types of engineers employed by organizations we surveyed). In the main part of the report we present a qualitative analysis of respondents' answers, grouped under four headings—current and future needs for engineers; ability of the University of Alaska engineering programs to meet the employment needs of the engineering community; recommended changes and initiatives for the university's engineering programs; and observations to share. We then summarize our conclusions. Appendixes A and B present our letter to respondents and our telephone interview script.

METHODOLOGY

The engineering deans of UAA and UAF compiled a list of Alaska organizations representative of the engineering community. They tried to include organizations in all the categories for employment of engineers, developed by Neal Fried of the Alaska Department of Labor. These categories are engineering services; government; oil and gas; communications; self-employed; mining; and other private. Mary Killorin and Patricia DeRoche, ISER research associates, called the listed organizations to determine an appropriate contact willing to participate in a telephone interview. They faxed or e-mailed a letter signed by Dave Woodall, dean, UAF College of Science, Engineering and Mathematics; Sukumar Bandopadhyay, dean, UAF School of Mineral Engineering; Rob Lang, dean, UAA School of Engineering; and Dave Veazey, of UA Academic Affairs, to each contact (see Appendix A). The letter asked each person to participate in a telephone interview during March 2003. An outline of the interview questions was included with the letter (see Appendix B). The ISER research associates followed up on the letter with telephone calls and e-mails to establish a time for the interviews.

Ms. Killorin and Ms. DeRoche conducted the interviews in late March and early April 2003. Of those contacted, 35 agreed to be interviewed. Others were unable to make time in their schedules—often because of travel—but said they supported the university's effort to ask community members for their input. The interviews were conducted by telephone and lasted from 30 to 75 minutes. All participants were given an opportunity to review the interviewers' notes and to make changes, additions, or corrections. The interviewers used the interview format found in Appendix B. However, the participants were encouraged to engage in a conversation and give their opinions, even if they did not fit within the structured format.

As Table 1 shows, key informants represented a broad range of the engineering community. Thirty organizations participated. (In two cases, two respondents from the same organization participated in one interview. In two other cases, we interviewed two people from the same organization—one in the Anchorage office and one in the Fairbanks office.) Twelve organizations were engineering services or consulting firms; six were oil or oil-related businesses; five were government agencies; three were mining companies; two were utilities; one was a telecommunication company; and one was a small product-design firm.

Twenty-five of the respondents were in Anchorage; seven in Fairbanks; two respondents in the mining industry were in rural Alaska locations; and one respondent with a large oil company was located in Houston, Texas. Nine of the respondents had graduated from the University of Alaska—seven from UAF and two from UAA – and one respondent had three children who had graduated from the University of Alaska (two of the children had degrees in engineering).

Table 1. Persons Interviewed

		Title	Organization
Larry	Acomb		Geosphere Inc
Bob	Baldwin	Engineering Planner	GCI
Robert	Boswell	Principal Engineer	PDC Engineering
Steff	Browne	Laboratory Manager	Shannon & Wilson Inc
Pat	Crisenbery	Partner	Crisenbery Engineering
Eric	Dompeling	Project Director	Halliburton
Rick	Dye	General Manager	Fairbanks Gold Mining/Fort Knox
Greg	Fischer	Senior Data Project Manager	Resource Data, Inc.
Steve	Flodin	Facilities Chief	Ak. Dept. of Transportation and Public Facilities
Mark	Fryer	Vice President	PDC Inc
Bill	Griffith	Director of Central Engineering	Ak. Native Tribal Health Consortium
Dora	Gropp	Manager, Transmission and Special Projects	Chugach Electric
Charles	Harbin	U.S. Engineering and Technology Recruiting Manager	BP Exploration (Houston)
Bob	Jacko	President	Teck Cominco Alaska, Inc., Red Dog Mine
Earl	Korynta	President	USKH
Jon	Kumin	President	Kumin Associates Inc
Mike	Mason	Project Manager, Facilities Group	Ak. Dept. of Transportation and Public Facilities
Pat	McDevitt	Manager of Engineering	Alyeska Pipeline Service Company
Clark	Milne	Senior Engineer	NORTECH Engineering
Dave	Norton	Engineering Management Consultant	Alyeska Pipeline Service Company
Greg	Nutter	Drillling and Operations Manager for Alaska	Schlumberger, Alaska
David	Nyman	Principal	Restoration Science and Engineering
Dan	Roberts	Engineering Manager	Alyeska Pipeline Service Company
Jim	Rogers	Managing Partner, Business and Planning	Resource Data, Inc.
Daniel	Rogers	CEO	Electric Power Systems Inc
Beth	Shumway	HR Consultant	Conoco Phillips Alaska Inc
Paul	Skvorc	Project Director	Data Flow Alaska Inc
Jeff	Staser	Federal Co-Chair	Denali Commission
Dan	Sterley	Principal Project Manager	CH2M Hill, Transportation Group
Jim	Steward	Manager of Engineering Services	NANA-Colt Engineers
Olton	Swanson	Chief of Engineering Division	U.S. Army Corps of Engineers Alaska District
Fred	Wallis	Mining Engineer	Usibelli Coal Mine
James	Weise	Program Manager, Drinking Water/Wastewater Program	Ak. Dept. of Environmental Conservation, Division of Environmental Health
Jack	Wilbur, PE	President	Design Alaska Inc.
Michael	Wright	Vice President, Transmissions and Distribution	Golden Valley Electric Association

The following sections of this report are a qualitative analysis of respondents' answers to the interview questions. However, we did ask an initial quantitative question to roughly establish the number and types of engineers employed by the organizations that we interviewed. Some respondents were unable to answer this question. Others didn't have exact numbers but gave estimates or percentages. Below we summarize the data we did receive, to provide a backdrop for the qualitative summary.

All the respondents in the engineering services and consulting category estimated the number of engineers they employed. Of the 281 engineers with undergraduate degrees, 44 percent were civil engineers; 14 percent were electrical engineers; 12 percent were mechanical engineers; 8 percent were in computer sciences; 6 percent were environmental engineers; 6 percent were structural engineers; 5 percent were geological engineers; and the remaining 5 percent were chemical, mining, geometric, and engineering management engineers. Of these engineers, 20 percent had graduate degrees in engineering; 31 percent of the graduate degrees were in civil engineering; 20 percent were in structural or geotechnical engineering; 13 percent were in engineering management; and the remainder were in electrical, environmental, mechanical, geological, computer science, and mining engineering.

Four of the six respondents in oil and oil-related services estimated the number of engineers that worked in their companies or under their supervision—a total of 336 engineers. Of these, 36 percent were petroleum engineers; 18 percent were mechanical engineers; and 13 percent were in engineering management. The remaining engineers had degrees in civil, electrical, or chemical engineering. Only two of these companies reported engineers with graduate degrees, so the numbers are not very meaningful. Of the small number reported, 40 percent of the graduate degrees were civil; 24 percent electrical; 24 percent mechanical; and 12 percent chemical or petroleum engineering degrees.

Three of the five government organizations reported the number of engineers employed, but two of the agencies reported numbers only for their divisions, and the U.S. Army Corps of Engineers accounted for the rest (233 engineers of a total of 262). In this category, 45 percent of the engineers had degrees in civil engineering; 13 percent in environmental engineering; 11 percent in mechanical engineering; and the remainder in electrical, geological, chemical, arctic, and other engineering specialties. Among the government-employed engineers, 26 percent had graduate degrees. Of those with graduate degrees, 39 percent were in civil engineering; 10 percent in mechanical; 10 percent in environmental; 10 percent in geological; 3 percent in electrical; and 28 percent in the category "other."

Both utility companies reported the number and type of engineers they employed—a total of 57. Of those, 56 percent had undergraduate degrees in electrical engineering; 23 percent worked in the area of engineering management; and the rest were civil, mechanical environmental, or geological engineers. Only 7 percent of these engineers had graduate degrees, with 25 percent of those in electrical engineering and 75 percent in engineering management.

All three mining companies reported the number and type of engineers for their Alaska locations—a total of 47 engineers, with 21 percent having their undergraduate degrees in mining engineering; 19 percent in geological engineering; 11 percent in environmental engineering, and the remainder in civil, mechanical, and computer science. Among the engineers working for mining companies, 15 percent had graduate degrees. The actual number with graduate degrees was seven—two in mining; two in geological engineering; two in metallurgy; and one in engineering management.

The respondent from the telecommunication provider reported that 75 percent of his engineers had undergraduate degrees in electrical engineering, 21 percent in computer science, and 4 percent in civil engineering. Of these engineers, 27 percent had graduate degrees—45 percent in electrical engineering and 55 percent in engineering management.

Now we turn to analysis of our interview responses, divided into sections on current and future needs for engineers; ability of the University of Alaska's engineering programs to meet the employment needs of the engineering community; recommended changes and initiatives for the university's engineering programs; and observations respondents wanted to share.

CURRENT AND FUTURE NEED FOR ENGINEERS

We asked respondents how they expected the number of engineers in their organizations to change in the next 1 to 5 years and why. Seven of them saw their businesses expanding; five envisioned slow growth; seven said that there would be no change in the number of engineers employed; and two said that they expected a decrease in numbers.

Table 2: How do you expect the number of engineers in your organization to change in the next 1 to 5 years?

Expand	Slow Growth	No Change	Decrease
13	6	11	2

Eight who said that their businesses were expanding were consulting firms offering engineering services (two of these were national firms); three were government organizations; one was a telecommunication provider; and one was an oil services company. Of the six respondents who expected slow growth, four were consulting firms, one was a utility, and one was a government-related agency. The eleven organizations that expected no change consisted of two very small firms, three mining companies, four oil-related companies, one utility, and one state agency. The two respondents who expected a decrease both provided services for the trans-Alaska pipeline.

As reasons why they expected growth, respondents cited the strength of the federal sector, due to the leadership of Ted Stevens in the U.S. Senate and Don Young in the U.S. House of Representatives. They expected increased appropriations for transportation, missile defense and other military projects. Respondents also believed that the state and local sector would be strong for the next few years, because of bond issues that have already passed. But beyond that, the future appeared to be less certain.

> I think the federal sector will be very strong. The state and local public sector is good for the next two or three years because of the bond issues that have passed. There is a strong increase in demand now because of the work being shoved into the pipeline. The future is cloudier. I think we will have the same experience that Oregon did when they lost Senator Hatfield or Washington state did when it lost Senator Magnuson. . . . On the private side, we just don't see the volume.

One respondent from a large consulting firm said that he expected a 1.5 to 2 percent rate of growth in its Alaskan markets. A respondent from another large consulting firm thought it would see growth of 3 to 5 percent in 2003.

> We have a target growth of three to five percent a year. So we would assume that our growth this year would be in that range, both because of changes in the level of our current business activity and because of expansion of our business into new activities.

Next we asked what the turnover rate was for engineers within the organization, reasons for the turnover, and whether the turnover rate was a problem within the organization. We found that most respondents had very low turnover rates. When there was turnover, retirement and geographic relocation were the reasons mentioned most frequently.

Table 3. What is the annual turnover rate of engineer employees?

Less than 5%	Less than 10%	More than 10%
11	10	6

Table 4.What are the reasons for turnover within your organization?

Retirement	Relocation w/in company	Geographic Relocation	Another Job
12	8	9	8

Although retirement was mentioned, several respondents indicated that an aging work force was not a problem in the engineering field compared with other fields.

> I don't see retirement affecting engineering quite yet. I am just starting to see it, but I see good young engineers coming up. It is not like construction, where the average age keeps going up. For example, in my firm the average age remains stable.

Respondents who did find turnover to be a problem mentioned the difficulties of hiring mid-level or experienced engineers; people moving out of state or to competitors; and budget constraints.

> If we lose mid-level engineers, they are the hardest to come by and it may be a long time until we can fill that position. We are still building up the entry level positions but aren't able to fill the mid-level positions from in-house yet.

> The two primary reasons for the turnover are geographic relocation outside of Alaska and going to another firm. The problem is keeping people in Alaska. . . . It disrupts the flow of our business and it costs us money.

Two respondents who worked with oil-related companies said that their companies considered turnover due to relocation within the company to be a good thing.

> When we think of turnover we think of people leaving the company—that rate is very low. We consider moving within the company to be good turnover and that is high.

> For us turnover is defined as the person leaving the company to go to another company. Going to another one of our sites throughout the world is simply called doing business.

Finally, two state agencies mentioned the problem of training newly graduated engineers but not being able to keep them because of salary scales and benefit packages that can't compete with private organizations.

> There is a twofold problem from my perspective: (1). Alaska is not "down in America" and so you have a limited supply of registered professional engineers and engineering graduates and the State of Alaska cannot afford those we do have available. We cannot be competitive with the private sector. To replace senior-level engineers with junior-level engineers is very difficult because they don't have the educational background or the work experience to effectively do the job. The state salary structure for engineers is $10,000 to $20,000 too low. (2). We are the training grounds for new engineers. Once we have trained new engineering graduates, we have made them a valuable commodity to the private sector and they leave state employment for private sector jobs that pay more. There is a bittersweet reward for us though—we know we will be dealing with competent, knowledgeable people when they go to a local engineering consulting firm.

We asked where respondents did their recruiting for both new and experienced engineers.

Table 5. Where do you do your recruiting and hiring of engineers?

Nationwide	Alaska	UAA/UAF	All	Web
16	12	15	5	5

The majority of respondents looked to Alaska for their recruitment of engineers.

> For engineers we strictly look in Alaska first. We generally look at UAA or UAF—then . . . we might wheedle someone from another firm in Alaska. . . . I am often critical or at least cautious with someone writing from outside Alaska asking to be employed at our firm. Job applicants need to have some legitimate experience with Alaska. There is a threshold here. There are lots of folks who would like to "try" Alaska, but not on our nickel. If I had a stack of ten resumes before me and there were three with practical Alaskan training, experience, and the skills I desired, I probably would not even contact the others in the stack. That's how important it is to have Alaska experience in engineering.

Six respondents said they used Web sites for recruitment. With the exception of one oil company that advertised in the *Houston Chronicle*, respondents rarely used newspaper advertisements.

> We recruit from within first and then we will recruit nationally—we usually use our Web site, but if we have a specific position to fill in a

> hurry we hire a headhunter. We use the newspaper less frequently than we used to. Often word of mouth is the best, since the engineering community is still small. We also try to go to both UAA and UAF to recruit every year. We talk to the deans and our other contacts. The student chapter of ASCE (American Society of Civil Engineers) is a valuable source.

However, some respondents had trouble finding enough experienced engineers within Alaska.

> We have trouble finding enough people that are experienced. We recruit everywhere. For the first time this year, we actually tried to use recruiters.

> I am having a terrible time finding Alaska registered engineers in chemical engineering. There are approximately 70 chemical engineers registered in Alaska, but only about half of them actually reside in Alaska. They are retired, work for consulting firms outside, or have transferred with Conoco Phillips or BP.

ABILITY OF THE UNIVERSITY ENGINEERING PROGRAMS TO MEET THE EMPLOYMENT NEEDS OF THE ENGINEERING COMMUNITY

Our next set of questions addressed the university's current ability to meet the employment needs of the engineering community. We asked respondents questions about the number of newly graduated engineers they expected to hire this year; the advantages and disadvantages of UAA/UAF engineering programs; and whether respondents offered engineering internships in their organizations.

The majority of respondents expected to hire one or two engineers in the coming year. Four of the respondents who expected to hire three to four new engineers were large consulting firms; two were government agencies; one was a rapidly growing small firm; and two were large oil companies. The U.S. Army Corps of Engineers expected to hire six to seven newly graduated engineers in the coming year and an international oil services company thought it would hire 20 new graduates for positions in Alaska.

Table 6. How many newly graduated engineers do you expect to hire this year?

1-2 New Engineers	3-4 New Engineers	5 or more
13	9	2

Most respondents thought that Alaska graduates were more likely to stay in Alaska.

Table 7. What advantages do you find in hiring new graduates of UAA/UAF engineering programs?

Know Alaska	Cost Savings	Stay in Alaska	Network/Contacts
18	10	21	4

> It's fairly easy for us to hire people with 5 or 10 years experience, but the trick is to get them to stay. If we hire UAA/UAF people, there is a greater chance that they will stay for 20 or 30 years. We are investing in young people hoping that they will stay here. That's why we are willing to hire people straight out of school and put the effort into training them.

They also thought that knowledge of Alaska and Alaska engineering problems gave UAA/UAF engineering graduates an advantage.

> UAA/UAF grads know Alaska—the politics, environment, cold engineering requirements. They are more likely to stay here because they grew up here. I have some really good engineers that came out of UAA/UAF.

> They also have more knowledge of the local conditions, and the political environment as well. We manage projects, and you have to have sensitivity to the people and the conditions that you are working with—like the darkness, climate, etc.

One respondent emphasized that knowledge of Alaska gave Alaska graduates the additional advantage of being able to communicate effectively with local communities.

> If we can hire someone who has lived in a village—that is a huge advantage. Engineering is only partially about the technical matter; the biggest part of engineering is being able to communicate with the customer.

Ten respondents also cited cost-savings as an important advantage when hiring graduates of UAA/UAF engineering programs.

> There is a savings if we hire in Alaska. The most expensive people to bring up are the more seasoned people because they are established and the cost of moving them is greater.

> Typically moving an employee to Alaska costs the company about $30,000 in expenses.

Four respondents mentioned the value of networking and the contacts that come from living in Alaska and going to school at the University of Alaska.

> Another advantage is that by having that Alaska-flavored training they can network with their professors, schoolmates, and other graduates, and they are not lost in the milieu of a challenging Alaska practice environment. They have embedded skills and Alaska-knowledgeable personal resources. They know people and they bump into them at business luncheons and other functions.

> I graduated in 1974 and I am astounded at how many people I run into over and over again from UAF. They do have a tendency to stay around. I don't know exactly how many of the engineers in our company are UA graduates but I would guess about 50 percent—I also run into graduates at clients' and competitors' offices.

One respondent said that the university's academic calendar gave him a hiring advantage.

> . . . typically Alaska's university students are out earlier in the spring and start later in the fall than students in other states. That gives me an earlier hiring advantage and we can hold them later in the fall.

Another respondent mentioned the computer training provided by the university engineering programs**.**

> Some of the advantages to hiring a UAF or UAA graduate are that the university is making a distinct effort to train its students in AutoCAD and Internet use. For tomorrow's engineers this is absolutely critical.

Finally, one respondent concluded**:**

> It helps us to build a rapport with the university and be a good citizen. We are always able to find good, adequately trained engineers there.

We also asked respondents if they found any disadvantages to hiring UAA/UAF graduates. Thirteen respondents cited no such disadvantages.

Table 8. Do you find any disadvantages to hiring graduates of UAA/UAF?

None	Not Enough Available	Need More Experience	Less Diversity
13	7	4	2

Seven more respondents said that the only real disadvantage to hiring UAA/UAF graduates was that the university did not graduate enough engineering students to provide enough choice and to meet their needs.

> . . . not enough graduates to provide a wide choice and graduates not being available in the desired field of expertise. . . . That is probably the reason for some of our national recruiting in this firm.

> UAF just has not graduated enough engineers. Last year there were two or three and they were snapped up before we had a chance to talk to them.

> It can be a problem that there are not a wide variety of folks to choose from. The preferable thing for us is to get students engaged as interns and have some time to evaluate them so that we can have a spot for them when they graduate. By doing that, the small pool of people isn't an issue because you have had time to evaluate people.

> It would be nice if there were more graduates. We are one of the state's top employers for engineers. If there are just a few top graduates in a class, we usually have an opportunity to hire them but it would be nice if there were more graduates in petroleum engineering in particular.

One respondent from a large international firm said one disadvantage was that UAF graduates did not want to relocate outside the state.

> So the low number of graduates is a problem, and also the low mobility of your graduates could be a problem for us in that many of people who do graduate from UAF do not want to relocate outside the state.

Four respondents said that lack of experience was a disadvantage for them.

> I need people with more experience. They need to have the engineering degree, registered if possible, but also have been out in the field working with the old-timers figuring out what works and what doesn't.

> The scope of their experience tends to be less than those found in wider markets.

Finally, one respondent mentioned a concern with a particular program.

> Well if there is one thing is that could be considered a disadvantage for our company it is that I feel over the last five years the power program at UAF has weakened instead of improving.

Our last question for respondents in this section was whether they currently had internships in their businesses and whether they would like to have them in the future.

Table 9. Do you currently have engineering internships in your business? Would you like to have them in the future?

Currently Have	Had in the Past	Would Like in the Future
21	4	7

Two-thirds of the respondents currently had engineering internships. They all believed that internships were important for their organization, for the students, and for the university's engineering programs. One respondent summed up these collective benefits:

> I think internships are very beneficial to both parties. They provide an incentive and decent pay to students who otherwise have limited resources. They provide new life to engineering firms. They make the engineering students much more aware of the engineering concepts they must learn, thus improving their confidence and making the instruction more effective. They bring students back to Alaska as professionals. Time in responsible intern programs can contribute to licensing experience. For the firm, intern programs increase the possibility that the individual will come back. They also make the engineering firms a partner in developing good engineers and enhancing the university's ability to produce quality graduates. In order to make an intern program a success, the university needs to vigorously engage in developing intern programs and commitments to that program with medium- and large-sized firms. The university should actively seek to promote internship programs. They shouldn't wait for

> the firms to come to them. Internships need to be a part of the overall university engineering program. Do not limit your contacts to engineering firms. Contact contractors and inspection firms too.

Another respondent pointed out that internships give employers an opportunity to screen potential new hires and to save money.

> We especially like those graduates that have gone through our internship programs because we have had a chance to review the quality of their work before we hire them and we don't have to pay for their moving costs, because most likely they will be local.

Two respondents specifically mentioned the benefits of the UAA Alaska Native Science and Engineering Program.

> We have an excellent Native intern program—we are a sponsor of the Alaska Native Science and Engineering Program (ANSEP). We have about 12 interns per summer. We have been able to fill our entry-level jobs with interns in the past two years and we expect to be able to continue to do that. ANSEP has been an excellent program for us. We can't match the salary of the oil companies but we get people interested in doing good things for people and they are the people that stick around.

One respondent also mentioned that interns provide firms with future contacts.

> Interns also provide us with future contacts—lateral marketing and of course we benefit from their varied experiences as well.

Of the seven respondents who said they would like to have internships in the future, four said they had interns in the past and were very supportive of internships.

> We do not currently but we have in the past and I am confident that we will in the future. We have had three interns in the last five years. None of them are with us now, but it went extremely well at the time —it was both good for them and good for us.

Two of the three remaining respondents, who said that they had not had internships in the past but would like to have them in the future, were from large firms and indicated that they would raise the issue within their organizations.

> . . . I think the area of internships would be a good avenue for us to explore. I plan to look into that possibility in the future.

> I don't know if we want to have them, but I will certainly be running that by my boss to see if that would be something we would be

> interested in. There are certain liabilities and safety concerns and inherent risks that may prevent us from doing this, but it is something worth looking at.

The third respondent said that he had worked with professors and students at the university on projects but he was concerned that an internship would change the structure of his sole-proprietorship business.

> Probably not but it wouldn't be a bad thing. I have worked with professors at the university. . . . I have also worked on a project with . . . students. I would be happy to work with the university again but I wouldn't hire people directly because it would change the structure of my business and wouldn't be worthwhile.

RECOMMENDED CHANGES AND INITIATIVES FOR THE UNIVERSITY'S ENGINEERING PROGRAMS

In this final set of questions, we asked respondents about their familiarity with engineering programs at the university and their recommendations for change. Only one respondent said he was not familiar with the university's engineering programs.

Table 10. How familiar are you with the engineering degree programs offered by UAA/UAF?

Familiar	Moderately/Fairly	Not at all Familiar
18	15	1

The one respondent who said that he was not at all familiar with the programs was very interested in learning about them.

> I would like to learn more about it. (Is there anything we could do to help—perhaps send you information?) No, I don't think that would be as valuable as spending time at the university meeting all the people involved in the engineering program, learning what courses they offer, and walking around the grounds to see the facilities—things like that.

Our next three questions asked respondents what would be the most important initiatives or changes that the engineering programs could provide to them. We asked them to consider three perspectives—that of their firm, the primary discipline they represent, and the engineering community in general. We analyzed respondents' answers and then summarized them under the following headings: expanded professional development, program delivery, classes, additional programs, associate degrees, master's degrees, and doctoral programs.

Expanded Professional Development

Over half of the respondents encouraged the university to expand its offerings of courses and seminars for professional development.

> Keep my colleagues and myself interested in ongoing education. I support the university sponsoring forums to bring the community together to network—hopefully interdisciplinary forums.

> I would say maybe expanding the professional development area, whether that would be expanding classes at the university level, or planning conferences or perhaps professional seminars.

> I think that the theme here from my standpoint is that the university probably could be much more of an asset to us in the future. The area of continuing and expanded professional development would be of primary importance.
>
> However, another factor to consider is that a majority people in our company do feel professionally isolated by being located in Alaska. They would like to know more about what the rest of the world outside Alaska is doing . . . So weekly technology seminars and bringing in industry spokesmen to discuss what is happening in their fields could be something that would interest people.

Several respondents indicated that their companies paid for employees to take courses.

> Our company pays for any classes that our employees take. I think professional development courses are needed both in the guise of graduate programs offered at UAA and UAF and short courses and seminars. I think these courses are a service to the community.

One respondent mentioned that his company contracted with UAA for all its training needs.

> Professional development opportunities are the most useful thing for what we do. . . . UAA handles all our training via our in-house training people. We tell them what we need and they go out and find it. That seems to be working well.

Several respondents encouraged the university to support a mandatory PE (professional engineer) license renewal and CEU (continuing education units) certification program in Alaska. They pointed out that more and more states are requiring engineers to have continuing education credits in order to maintain their registration. They suggested that the university work with professional engineering organizations to accomplish this goal.

> I think the university should develop a required PE license renewal and training program by offering a certain number of continuing education units per year. In Alaska, once you get your PE license, you can work in any area. I think the training needs to be more specific, and the PE license also should be restricted to specific work based upon training/expertise. Currently, there are no continuing education workshops or training required for the PE license renewal.

One respondent also suggested that UAA offer the professional engineering exam preparatory course twice a year.

> As I mentioned, we push licensure. The professional engineering exam preparatory course offered through UAA is very important to use. We would like to see it offered twice a year. We are always willing to pay for someone to take that course.

Not all respondents thought that the university was the best organization to develop courses for continuing education and professional development. Some respondents thought that professional societies, national training schools, and vendor schools were better able to offer specialized training specific to their needs.

> A lot of our professional development winds up being more vendor schools. In general, our senior engineers are more knowledgeable about what they are doing in projects and real-world applications than university professors. For example, if you really want to know more about putting in a new generator you go to ABB, Solar, or General Electric. The average university professor hasn't had the experience.

However, one respondent who used professional organizations for training encouraged the university to meet as many specialized needs as possible since local courses provide a cost-savings to employers.

> Courses need to focus on specific disciplines so a large range of courses could potentially be needed. . . . Some professional organizations do this—American Management Association, Project Management Institute, Design Build Institute of America. . . . Those organizations are more geared to meeting the continuing education needs of engineers than the university, but that is not to say that the university shouldn't try to meet those needs. The cost of traveling to San Francisco and Seattle is large—plus salary, plus cost for the course. In times of tight budgets it's difficult to make those trips happen. The more courses that are available locally the better.

Program Delivery

We asked respondents what kind of program delivery mechanisms worked for them. We summarize their responses under two headings—distance delivery mechanisms and short courses.

Distance Delivery Mechanisms

Ten respondents said that the university should develop Web-based courses and use other types of distance delivery.

> Internet availability is useful to us because we have people who work field schedules—two weeks on, two weeks off.

> Internet-based learning is coming as more broadband capability is out there. I see the universities around the United States—even the world—beginning to compete for students.
>
> There needs to be a better job of matching program offerings with demand. This is especially true for professional development. I have heard people in town saying that they can't find the classes they need in Anchorage. There is a lot of competition from schools delivering programs on the Internet. The university needs to look hard at getting the program content delivered in some sort of distance delivery format.

However, seven respondents said that they had problems with Web-based courses.

> I am not in favor of program delivery mechanisms especially in terms of e-learning. I think that on-campus experience is necessary.
>
> Our preference is a one-on-one classroom environment. The highest quality training you are going to get is with an instructor.
>
> . . . when you get to the development of more advanced cognitive skills you may need more than the Internet. Thinking of knowledge as a commodity is the wrong way to think about it. There is a difference between academic knowledge and skill sets. When you get to more advanced cognitive skills you need an interdisciplinary group. . . . You do have to be on campus to collaborate with peers.
>
> I would like to also make one last comment on the topic of change in program delivery mechanisms. I think the Internet is great, but too much concentration on computer interfacing detracts from focusing on a student's ability to work with people, in other words, people skills. So much of what we do is team work. We do not work in isolation, and the ability to interface with people is extremely important.

One of the seven respondents said that said that she personally did not like distance delivery courses but did see them as a thing of the future.

> Personally I don't do well on televised or Internet classes but I think it is the thing of the future and it may help.

Three of the seven specifically mentioned the Web-based Arctic Engineering course UAA offers*. One thought it should be a regular classroom course.

> I have heard some feedback that people were not as pleased with the Internet version [of the Arctic Engineering course] as with the live

* The UAA Web-based course is revised every semester. Currently – Spring 2003 – it is offered for one credit in a two-week intensive three times a year.

> version. We would like our people to be able to take that course in person. I realize that it might be good for an oil company in Houston to have the Internet course available but the regular classroom works better for us.

Another thought it was awkward to use and should be improved.

> Online courses can work but I think they are awkward. The one course I reviewed was the Arctic engineering course and I think it is awkward to take online. I think the course is very important. The Arctic engineering course is not offered very often and it is offered in bizarre places—e.g. the University of Utah or the University of Washington—and infrequently. It is difficult for engineers from outside to take this course. . . . The online course needs work.

The third respondent thought the Web-based course was good but that there should be more classroom sessions in conjunction with it.

> The fact that the Arctic Engineering degree program is Web-based is good, but I would like to see more classroom sessions along with the Web-based course.

Short Courses

Several respondents said that they would like the university to offer more specialized short courses in specific areas.

> I would prefer professional development short courses on relatively focused topics. UAF has a much larger environmental engineering staff than UAA but most of the environmental engineering community lives in Anchorage and not in Fairbanks. It might be workable if UAF professors came down to present two- or three-day (up to a week) short courses in Anchorage. One or two days are not enough—there isn't enough time to do the math and work out the problems. You can learn principles but not how to apply them.

Two respondents thought that these courses could be self-supporting if the university made more of an effort to communicate with the engineering community.

> I understand that it is difficult to get enough students for specialized courses sometimes but I think the university . . . could establish a good feedback base through e-mail with companies and agencies. If you have the right contact and the right people, it would be possible to send out an e-mail and ask how many people are interested in a specialized short course. For example, if I received an e-mail from the university asking who might be interested in a particular short course, I could get that information out to our staff and get an answer in a day or two back to

> the university. I think the university would be more effective if it developed this kind of communication and feedback.
>
> UAA/UAF should fund more short courses in the contaminated site area. Hopefully these short courses could be self-supporting. The courses have to be offered in Anchorage because that's where almost all of the engineers are—ultimately they should also be offered in Fairbanks. I can think of half a dozen topics that would be beneficial. These courses could then be used for a master's degree at UAA or UAF. I think there would be greater demand for the short course than a semester long course. In order to fill the short courses and make them self-supporting, the university should solicit DEC, the consulting firms, and the U.S. Army Corps of Engineers to make sure their people signed up once the university was ready to offer a course.

On the other hand, some respondents preferred traditional courses to short courses. They believed that short courses would be too specialized to meet their needs.

> We do have a lot of people from the district attending UAA courses. I tend to push that more than attendance at a weeklong course somewhere. I think the average weeklong course is designed to meet a certain agenda. I believe that the university courses are much more grounded—they are dealing with broad basics as opposed to specialized activity. I am not looking for highly specialized people—we are going to contract out 70-80 percent of our work. We need to be comfortable interacting with a consultant on whatever technology he or she uses but we don't need to be specialists. The weeklong courses might be useful for one project but the person may never use that information again.

Most respondents believed that short courses should be three to five days long. One respondent said that he would like to see the university offer "more Saturday (weekend) classes for engineering courses (graduate courses or continuing education courses)." Another respondent wanted the university to "provide more after-hours and evening courses for continuing education and enhanced graduate programs."

Classes

Several respondents emphasized the importance of requiring communication classes for all technical degrees. They saw communication skills as the key to getting contracts, working with clients, and developing the kind of teamwork necessary to develop solutions to technical problems.

> In general, the UA graduates are highly competent in the technical field they are trained in but I see them consistently lacking in communication skills—the ability to hear what someone else is saying, write it down, feed it back to them. I do not see communication classes required for technical degrees. Poor communication is a consistent

> weakness in new hires and it is the thing that will limit their careers the most. When I do evaluations on people, communication is about 30 percent of their evaluation. The ability to write a good paper is important but the skills needed are greater than that. There is a problem because graduates have an attitude that knowing the technical skills is enough. We have sent people back to classes in writing and communication even though their technical skills were excellent.
>
> Engineers need to know how to speak, write, and sell their ideas to clients. They need to be able to explain the reasons behind the laws and the importance of doing things correctly. You can learn that while you are in school, or you can learn it 20 years later. It is best to come to grips with this good-practice concept when you're starting out and new to the field.
>
> We are seeing some difficulty with the work force—especially technical folks who by nature are more introverted—working with a team to develop technical solutions. You can have the best technical solution in the world but, if you can't communicate it to folks, it won't do you a bit of good.

Two respondents encouraged the university to develop a multi-disciplinary approach to the engineering programs.

> Nationally universities are becoming ever-more interdisciplinary in their organization—we need to do that here.
>
> Engineers and the design project they are involved in provide correct answers that may be wrong for a particular community. The only way to avoid providing the technically right answer that is the incorrect solution for a particular situation is to include social, economic, and environmental factors in the design process that are beyond the typical scope provided by a funding agency. One answer is developing better communication and outreach skills and integrating multiple disciplines early on in the design process. The university may be a vehicle for this type of interaction and expanding and integrating the scope of the design process.

Two respondents advocated for a mandatory ethics class.

> Professional ethics are so very important, but they can get crowded out because there are so many technical skills that need to be mastered before one completes a BS degree. The public depends on engineers to do their job ethically and forthrightly to protect public health and safety. You and I have seen people (clients) cut or limit their costs by parsing their services so they can buy them for fewer dollars, but in the

> end that becomes self-defeating. It goes too far. Ethics help you to realize where the line is, where you have gone too far in going along with such erosion, and then you know that you just have to be smart enough and strong enough to walk away.
>
> I don't know if the University of Alaska (UAF and UAA) has a mandatory ethics class but an ethics course should be required for every student in every engineering discipline. I personally feel that this has become a real problem in this day and age and the students need guidance in these matters.

Two respondents said that it was important for engineering students to be familiar with computer modeling.

> One thing that is becoming more important in the transportation industry, and I think to other groups, is the use of computer models. The input parameters are huge. Having people that are trained in the use of those models—also who know what models are out there and what they are capable of—is important.

Respondents also suggested classes on the following topics:

- Regulations and technologies for drinking water and wastewater treatment applicable to Alaska
- Structural engineering
- GIS and GPS systems
- IT programs
- Building codes and specifications
- Negotiations
- Project management

Finally, one respondent who worked with an oil company suggested that the university should form a relationship with APICC (Alaska Process Industry Careers Consortium).

> It would be good if the university had a connection with the petroleum training curriculum offered by the oil companies so that university students could take advantage of the courses taught there.

Additional Programs

Some respondents cautioned the university to focus on the basics before they considered adding programs.

> I think the priority for the university should be to work on enhancing what they already do well, which is to educate students in the engineering disciplines—so it produces graduates who have the required tools to be productive in today's environment. Until the

> university gets that done well it would be a mistake to go off in other directions. It needs to first achieve excellence in the basic areas.
>
> We just need good, solid undergraduate degree people with good basics in physics and mathematics. After they have been here a few years, which discipline they degree in becomes less important. In most of our jobs you just need general engineering knowledge.

One respondent cautioned the university about trying to be everything to everybody.

> However, I want to say that sometimes the university needs to be the one setting the standard and driving the courses. You cannot be everything to everybody, but you are something to everyone. You can't be too meek. Sometimes have to be telling people what is important instead of asking.

However, several others encouraged the university to expand its programs. Three respondents said there needed to be a bachelor of science in electrical engineering degree program at UAA.

> In order to meet my needs I need a strong electrical engineering program. The BS degree only in Fairbanks means that students aren't available to me while in school. I know a bunch of engineering students that need to supplement their income and would like to work and go to school at the same time. If students don't want to go to Fairbanks they leave the state and don't come back. If they could stay in Anchorage, I think they would stay in Anchorage for the cost savings. Not having the degree program here makes that impossible.

One of the three respondents also wanted chemical and mechanical engineering degree programs at UAA. Another respondent said that there was a need for a mechanical engineering degree with a focus on fire protection.

> I think the university should consider establishing a program in fire protection engineering. If it could expand the associate program into a BS program, a person could get a mechanical engineering degree with a focus on fire protection. Many owners require work from a registered fire protection engineer. Currently, there are only two registered professional fire protection engineers practicing in Alaska; one of them works for us. People with this kind of training can become fire marshals and city building officials, as well as consulting engineers and specialty contractors; there is a market out there for people who have that additional training.

Two respondents in the oil industry advocated for a degree program in petroleum engineering at UAA.

> Unfortunately where UAF is located makes it difficult for the bulk of the petroleum group to deal with the university because when they are in the state most of them are in Anchorage. [There must be a] change in the program delivery mechanisms in order to bring the classes to Anchorage. Proximity is the problem—not program content.

One respondent talked about the increasing need for professional training for land surveyors.

> We cannot find good land surveyors anymore. The survey business is changing from a non-professional tradition to a profession requiring very specialized skills. We are finding a lack of good surveyors all over the country. The good people are earning excellent salaries—in some cases what we pay our professional engineers and architects. Many licensed surveyors are not graduates. I see that as an area with great potential for this state.

Other respondents suggested the university develop programs in facilities management and architectural engineering.

Associate Degrees

Three respondents suggested additional associate degrees in technical areas.

> I would like to see the university offer a technical degree in a laboratory or field-testing type of program for soils, concrete, and asphalt.

> In addition, we have a large staff of technicians who support our architects and engineers—for example, experts in CAD (computer assisted design), technical computation and production tools. [This firm] uses technicians for all its design drawing work. Typically those technicians are people who learn on the job or come out of a technical school. However, I think the university should consider a two-year associate program in these areas. Shorter programs at technical schools often aren't sufficient to cover the material. Students would benefit from the university environment. There is really a great need for this kind of training in Alaska.

Master's Degrees

Several respondents said there was a need for a software engineering/computer science bachelor of science and master's degree program at UAA.

> I would also like to see more master's degrees offered at UAA. This is especially important for computer science. This is an area of growth that is pretty obvious. If you don't have good computer science

> capabilities you are foreclosing huge opportunities. You talk to people in the oilfields about the systems they are using for exploration. Without a good, steady supply of people who are really good at these systems you are handicapping yourself. I think the university should put more emphasis on that kind of education. I know there is sentiment that we can't have it in both Anchorage and Fairbanks but I think that is shortsighted. I don't believe it is a zero sum game.
>
> I think information technology is an expanding market that UA needs to address. Some of our IT people now come from outside—we use people in other locations in our company and we haven't recruited from here yet. If we put out a call for a specific discipline company wide and can't find someone than we get into a hiring mode. Having people available to hire here would be a good thing. We need graduate level degrees. IT people usually have a working engineering background—primarily civil—and then they specialize in different types of software.
>
> I think it is important to encourage the crossover between computer science and engineering. [We have] strongly supported the development of a computer systems engineering program at UAA through a master's degree. This kind of adaptation to needs is very desirable for business and industry. The need for that program grew out of UA's electrical engineering advisory council. We looked at what UA could do to help meet industry needs. You must put the classrooms where the students are.

One respondent supported advanced degrees in structural engineering, and several respondents said that advanced degrees in engineering management were very important.

Doctoral Degrees

While many respondents supported master's degrees at the university, only two respondents thought there was a need for a doctoral level program.

> I do think that both universities need to maintain a strong civil program including a master's degree. From the practicing engineering side, we don't usually have many doctorates. Our PhDs are mostly scientists as opposed to engineers. As soon as we force someone to go out of the state for an advanced degree, we are at risk of losing them.
>
> I would like to see a PhD in engineering at the university. . . I personally would like to do a PhD degree in engineering economics — concentrating on the sustainability of public infrastructure.
>
> I would like to see UAA have a doctoral program in engineering. I don't think it will attract people from outside until it does. I don't think people want to go up to UAF.

OBSERVATIONS TO SHARE

The last question we asked respondents was "Do you have any other observations to share?" We have analyzed their responses under five topic headings: University of Alaska programs are excellent; improve relationships with the community; expand engineering programs offered in Anchorage; suggested solutions for budget constraints; and other.

University of Alaska Education Programs are Excellent

Several respondents volunteered that they were pleased with the quality of the engineering programs at the university.

> I think the top people at UAA are as good as top people outside.
>
> When I moved to Alaska I was impressed with the level of engineering education and training that you have within the state.
>
> . . . their education [UA engineering graduates] in most instances is superior to what I get from the outside—both because they know more about Alaska and because they are generally better.
>
> Graduates are good—tend to be older, more diversified background, and more on-the-job experience. We are in the consulting business so the productivity of our employees is important.
>
> The only thing I would want to add is that being a graduate of UAF I know they have a quality program—as long as they continue to stay current with technology. All of the people I have met who came out of the program are quality people.

However, many respondents urged the university to improve relationships with the engineering community.

Improve Relationships with the Community

All respondents were pleased that the university was coming to them for suggestions to improve the engineering programs.

> In the past, the university has almost walled itself off from the community. I think it is good for the university to ask the community for feedback.
>
> I have been around but am not intimately aware of the situation at the university. This interview has, however, caused me to rethink a few things, and I will be keeping it in my mind for the future.

They urged the university to communicate with the engineering community and to ask for its participation.

> The university needs to go out and shake up the firms. The university must ask for participation, not wait for it to come.
>
> To do things like you are doing and seek out information from me for your future planning is very responsible on the part of the university. That sort of thing does not happen in other locations.

Respondents had several concrete suggestions for improving the university's relationship and communication with the engineering community.

- ***Attend professional society meetings***

  > I think the university should strongly encourage attendance at local professional societies and that professors and students should be involved in these societies. I know some of this occurs, but I am not sure how much. By knowing the professionals, they would get their support and they would learn about opportunities for their students.

- ***Develop a Web presence***

  > I support proper use of the Internet. I think as a communication tool between the university and the community and as an information access tool it is useful. . . . I think it is important to have a good university Web presence for the community.

- ***Create a liaison position***

  > We don't have a liaison at the moment with the university. The ideal situation would be if there was someone technical in engineering or CIS who would keep tabs on what we are looking for and tell us what classes and professors to talk to for jobs/interns. We want to know, in specific classes, what students are good and thorough. Job fairs are too wide open.

- ***Develop internship programs***

  > In order to make an intern program a success, the university needs to vigorously engage in developing intern programs and commitments to that program with medium and large sized firms. The university should actively seek to promote internship programs. It shouldn't wait for the firms to come to the university. Internships need to be a part of the overall university engineering program. Do not limit your contacts to engineering firms. Contact contractors and inspection firms too.

- ***Create an advisory board***

  The university needs to create an advisory board of professionals for its engineering school, who can feed back to the university the community's needs and concerns, thus providing guidance and support to the faculty and the university administration.

- ***Involve the community in meaningful ways***

  I tell them things and I don't know what happens to my suggestions. I don't know what is expected of me as a board member. I don't know if they are leveraging the resources of their board members. The university needs to involve the community in ways that are meaningful and make use of the expertise and resources of community members.

- ***Develop cooperation between the university and the business community***

  Nationally the academic community has not kept pace with the industrial community, particularly with regard to getting research accomplished at the university for the commercial community. More needs to be done to develop cooperation between the university and the business community

  I have tried to work with both engineering schools (UAA and UAF) over the years but haven't been well received. . . . I don't see any entrepreneurial spirit within the engineering departments (they seem to be more interested in protecting their turf than furthering the professions).

- ***Encourage engineering professors to be licensed***

  I think any engineering professor ought to be licensed. There is a provision in the state's statutes that allows university professors to not be licensed. I think that is an insult to people who are coming to school. I have attended three other schools in California and Colorado and their professors were all licensed. I believe it would bring the professional level up and place the professors on the level of the other professionals in the community.

Expand Engineering Programs Offered in Anchorage

Several respondents encouraged the university to expand the engineering programs offered in Anchorage because that is where the population and the jobs are located.

> I am a graduate of UAF and in 1974 that was the principal location for engineering programs. However, UAA has grown because that's where

> the population is. We would like to capture kids coming out of high school and get them into engineering. UAA has struggled to develop a complete engineering program. As an Alaskan resident, I struggle with having two complete engineering programs in the state. Our company has a lot of people who take classes at UAA. I have a personal bias for UAF as a graduate but it would be more convenient for me to go to UAA to recruit. If UAA and UAF could develop complementary programs as opposed to competitive programs I think that would be a good thing.
>
> At the moment the center of gravity for engineering programs at UA is in Fairbanks but hiring opportunities and internship possibilities are in Anchorage. There should be more focus on programs in Anchorage where the works is. If the university is really looking for ways to improve the delivery of graduates to the job market, it has to offer courses here in Anchorage where the major employment sources are.

They cited the need for advanced degree programs for engineers working in Anchorage, as well as the need for expanding the types of undergraduate program areas.

> There are two problems for us. (1). The lack of advanced degrees available in Anchorage for the people who live and work here; and (2). The lack of electrical, chemical, and mechanical degree programs in Anchorage. I know that it is a political problem but frankly it limits the university because people who are here who would like to have degrees in those areas simply are not financially or family situated so that they could move to Fairbanks. There isn't a night-school alternative for highly technical people to move forward academically in Anchorage. I don't know how to fix that, given budget constraints in the state, but it is a problem.
>
> We rely on the university for two things—entry-level engineers and professional development through the master's degree program. We have a lot of engineers enrolled in the UAA master's program. We really push certification, licensure, and graduate degrees. Unfortunately, there aren't as many courses and professors in Anchorage as there are in Fairbanks. Our employees would benefit from more graduate courses and instructors in Anchorage. It is difficult to get the courses you need to graduate from the UAA program because they are offered intermittently.

Respondents believed that the lack of degree programs in Anchorage caused potential engineering students to go "outside" for school. Their experience was that once these students left the state they did not return to Alaska.

> As soon as we force someone to go out of the state for an advanced degree, we are at risk of losing him.
>
> It creates some difficulties having the engineering school in Fairbanks. Alyeska has a presence in Fairbanks but BP, Conoco, and the consulting firms are here. It is difficult for an engineering student to have to move to Fairbanks to get a degree and then move back to Anchorage to get a job. I think we lose a lot of engineers that way.
>
> For example, we have a young mechanical engineer with a family. They make a reasonable living but would like to work toward an advanced degree. He could take graduate courses in mechanical engineering or fire protection. However, if what he wants weren't offered at UAA he would relocate to Washington or Oregon rather than Fairbanks. Once Outside, he may never move back. That is what we are up against. If engineers are going to leave Anchorage and a job here, why shouldn't they go to Oregon or Washington? If you don't like really cold weather, why subject the family to the rigors of the Fairbanks climate? The UAF education isn't any better than that offered in Oregon or Washington so there is no incentive to go there.

One respondent thought that students would stay in Anchorage because of the cost savings if more degree programs were available at UAA.

> I need a strong electrical engineering program. The BS degree only in Fairbanks means that students aren't available to me while in school. I know a bunch of engineering students that need to supplement their income and would like to work and go to school at the same time. If students don't want to go to Fairbanks they leave the state and don't come back. If they could stay in Anchorage, I think they would stay in Anchorage for the cost savings. Not having the degree program here makes that impossible. A bunch of young people want advanced degrees, but they don't want to sacrifice jobs to go full-time to school so they can't pursue a degree in electrical or computer science.

Most respondents said they understood that the university had to work within budget constraints. However, one respondent thought that the disparity in budget support for graduate programs between UAF and UAA was insupportable.

> I am appalled by the disparity in support for graduate study programs between UAF and UAA. The teaching load at UAF is half of what it is at UAA. The institution seems to be run to meet the desires of bureaucracy territory, as contrasted with service to the people of the state.

One of the respondents argued that locating programs in Anchorage encouraged the development of infrastructure and served the best interests of the state.

> We should not have our only comprehensive engineering school isolated from the center of population and commerce. Engineers develop the social infrastructure, and if you don't have enough of them, a negative economic impact is caused. Development within Alaska is retarded. Public demand for change is occurring and is being resisted by the UA system. The UA system needs to move away from a position of defensive entrenchment and openly consider how to serve the best interests of the state. The UA system is not now responsive to the public. Providing ready access to an engineering education in Anchorage serves the best interests of the state.

Suggested Solutions for Budget Constraints

Respondents recognized that the university was limited in its ability to expand programs to Anchorage by valid budget constraints. They offered suggestions for both stretching and expanding the current budget.

- ***UAA and UAF programs must collaborate***

> I know there is sentiment that we can't have it in both Anchorage and Fairbanks, but I think that is shortsighted. I don't believe it is a zero sum game. Both programs could support each other and feed off each other.
>
> If UAA and UAF could develop complementary programs as opposed to competitive programs I think that would be a good thing. Graduate programs are becoming more important. I think they need to be developed at both UAA and UAF in complementary areas. For instance if UAF had a structural engineering program, I would expect it to extend the program into the master's arena. I do think that both universities need to maintain a strong civil program, including a master's degree.

- ***UAF professors should come to UAA***

> One thing that seemed to work years ago was that the faculty from UAF used to come down to Anchorage once a week to lecture in courses at UAA—they even traveled to Juneau when demand warranted. I don't know if that goes on any longer. If analysis indicates that the need for courses is here in Anchorage, maybe UAF can offer courses by telecommuting and visiting lectures. They also could offer short courses and seminars here in Anchorage. UAA and UAF professors could provide courses in both locations depending upon their expertise.

- ***Develop a long-range plan***

  There is no long-range comprehensive plan for the University of Alaska and there has not been for 25 years. There is no attempt to project student growth in particular areas and provide facilities to accommodate that growth. The University of Alaska is not the only university that has gone through this. . . . The university should learn from the experiences of the other western states. The regents have adopted a strategic plan. However, that plan seems to be a political document not based on a comprehensive needs analysis. That plan describes Anchorage as a university with no doctoral program offerings, in any discipline—ever. The document seems not to be based upon an analysis of actual need—it seems to be based on political expedience.

- ***Match program offerings with demand***

  Ultimately there needs to be an expansion of the kinds of programs offered. The oil industry is centered here—eventually there should be an emphasis on petroleum engineering. There needs to be a better job of matching program offerings with demand. This is especially true for professional development. I have heard people in town saying that they can't find the classes they need in Anchorage.

  I don't believe that there is much demand for a mining engineering program, even though it was appropriate to have because we are a land grant institution.

- ***Actively pursue grants and research***

  I think UAA needs to actively seek grants and research. When I was there in 1995, I didn't think the engineering department was as aggressive as it could be in going out into the community to pursue grants and set up internships. I have participated in grants discussions as an outside professional. I did not see the fruits of these discussions.

- ***Attract more students***

  The university should attempt to increase staffing by attracting more students and grants. . . . The university as a whole should actively recruit students in the Lower 48 through job fairs and school fairs. I also think UAA needs to get involved in student activities at the high school level and work directly with the school districts to encourage increasing math skills and communication skills both in writing and speaking. The Engineers Week is not enough! The university could

> draw more students to the university by starting with them in high school or younger.

Other

Finally, one respondent asked the university to support reciprocity for engineers among states and countries.

> We are a global firm. Often I will find expertise that I need on my project in another country and I can't use the person—for example, I can't use a Canadian engineer unless I have an Alaska engineer supervising him. The university could take the lead in advocating reciprocity not just among states but also among countries. The university doesn't have to shoulder the load but could give its support to advocacy efforts. It is an issue that we have been struggling with as an industry and having the university system on board lending its weight and credibility would be helpful.

Another respondent urged the university to put the data it collects into an accessible database.

> The one specific comment I have is that UAF lacks database development. In today's world there is a lot of data collection, but it is difficult to take that information and put it into a format that is useable.

CONCLUSIONS

Below is a summary of the comments made by respondents that provide direction for the engineering programs at the university.

- The majority of respondents expect to increase the number of engineers they employ in the next 1-5 years.
- The majority of respondents recruit engineers in Alaska first. However, some respondent have to recruit nationally—especially to find experienced engineers.
- Respondents like to hire UAA/UAF graduates because they know about Alaska and are more likely to stay here.
- Respondents think that the University of Alaska engineering programs are excellent.
- Respondents want the university to graduate more engineers in order to meet their needs.
- Respondents think internship programs are very important.
- Respondents want the university to provide more professional development opportunities.
- Respondents want the university to improve its relationship and communication with the engineering community.
- Respondents want the university to develop a long-range plan and to match program offerings with demand.
- Respondents want UAA and UAF to collaborate in order to offer more undergraduate and graduate programs in Anchorage.
- Respondents want the university to pursue more grants and attract more students as a way of dealing with budget constraints.

APPENDIX A. LETTER TO RESPONDENTS

March 26, 2003

Dear

The University of Alaska would like you, as a leader in Alaska's engineering community to help us improve our engineering programs by participating in a telephone survey to be conducted during March 2003. UA President Mark Hamilton, his Statewide Academic Council, and the engineering deans at the Anchorage and Fairbanks campuses have commissioned this survey in order to help the university strategically plan how to use its engineering resources most effectively to meet the needs of the engineering community. Our goal is to graduate enough engineers to meet your current and anticipated future needs as well as to provide appropriate professional development courses. Your input will give us the data required to make programmatic choices that reflect your needs.

An outline of the survey questions is attached for your review. The telephone interview should take approximately 20 minutes. We have contracted with the UAA Institute of Social and Economic Research (ISER) to conduct the interviews, analyze the data, and prepare a written report. A research associate from ISER will contact you to schedule a convenient time for the interview. If you have questions about the survey, you may contact any of us or Mary Killorin at ISER (phone: 907-786-7724; email: anmk@uaa.alaska.edu)

We look forward to hearing your comments and appreciate your help in making this survey a success.

Sincerely,

Dave Woodall, Dean
UAF College of Science, Engineering and Mathematics 907-474-7608

Dave Veazey
UA Academic Affairs

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APPENDIX B. TELEPHONE INTERVIEW SCRIPT

ENGINEERING DEMAND SURVEY

Please briefly describe your business.

How many and what types of engineers do you currently employ? (For the purposes of this survey, "engineer" means a graduate of a bachelor level degree program in engineering or related programs.)

Type	Number	BS degree	Graduate degree
Civil			
Electrical			
Mechanical			
Environmental			
Chemical			
Mining			
Geological			
Petroleum			
Arctic			
Geomatics			
Computer Science			
Engineering Management			
Other			

How do you expect that number to change in the next 1-5 years? Why?

- Changes in the level of your current business activity
- Expansion of business into new activities
- Other

What is the turnover rate of engineer employees?

- Changing to another position or geographic location with same company
- Retirement
- Leaving firm for other employment
- Other

Is this level of turnover a problem for you?

Where do you do your recruiting and hiring of engineers?

- National
- In Alaska
- UAA/UAF

How many newly graduated (i.e., graduated within last 12 months) engineers do you expect to hire this year? Is this a typical year? Why or why not?

What advantages do you find in hiring new graduates of UAA/UAF engineering programs?

- Their education gives them more knowledge of Alaska engineering problems
- Cost savings in hiring process
- More likely to stay in Alaska
- Other

Do you find any disadvantages to hiring graduates of UAA/UAF?

- Not enough graduates to provide choice
- Graduates not available in desired areas of expertise
- Other

Do you currently have engineering internships in your business? Would you like to have them in the future?

The university is trying to utilize its resources efficiently and meet the needs of the community. The university is considering possible additions or changes to their engineering degree programs.

How familiar are you with the engineering degree programs offered by UAA/UAF?

From the perspective of your firm, what would be the most important initiatives or changes that the engineering programs could provide to you?

- Additional degree programs
- Expanded professional development opportunities
- Change in program delivery mechanisms (e.g., more or less Internet availability of professional development or certification preparation courses)
- Other

From the perspective of the primary discipline you represent (civil, electrical, mechanical, etc.), what would be the most important initiatives or changes that the engineering programs could provide to you?

- Additional degree programs
- Expanded professional development opportunities
- Change in program delivery mechanisms (e.g., more or less Internet availability of professional development or certification preparation)
- Other

From the perspective of the engineering community in general, what would be the most important initiatives or changes that the engineering programs could provide to you?

- Additional degree programs
- Expanded professional development opportunities
- Change in program delivery mechanisms (e.g., more or less Internet availability of professional development or certification preparation)
- Other

Do you have any other observations to share?